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ABSTRACT

This illustrated guide includes activities in Creative Arts, Language Arts, Math, Science, and Social Studies. Activities progress from an animal rhyme quiz for lower grades, to projects for upper level students on soil testing, relative humidity, and solar heat collection. The guide emphasizes activities selected to motivate students to appreciate the outdoors, rather than activities which promote "a conglomeration of facts and figures for this and that." (Author/RH)

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WESTSIDE OUTDOOR TEACHER'S GUIDE

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INTRODUCTION

This booklet was made possible by the Environmental Education Department in Tallahassee. The booklet is arranged according to grade level with activities selected to enhance all levels of elementary disciplines in an effort to maintain some kind of continuity with the Interdisciplinary Environmental Learning Packet that is available to all teachers with graded suggestions of activities in two workbooks.

You will discern that this booklet is not a conglomeration of facts and figures for this and that, but rather to encourage them to make use of the outdoor classroom. Activities have been selected to motivate interest in students in disciplines of learning more about what the outdoors can offer, and to stress to teachers that there is more to the outdoors than that which meets the eye.

Prepared by:
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ELEMENTARY CREATIVE ARTS

ALL GRADES

Game - Garden Scamp

The players hold hands in a large circle. One player is chosen to be the Scamp; he stands inside the circle. Another player is chosen to be the Gardener; he walks around the outside of the circle. When the Gardener sees the Scamp he asks, "Who let you in my garden?" The Scamp replies, "No one", and runs between and around the other players. While the Scamp runs, he may stop and make funny movements. The Gardener, who chases after the Scamp, must stop and make the same movements. If the Gardener tags the Scamp, the Scamp becomes the Gardener and a new Scamp is chosen.

Game - Flower Garden

The players sit or stand facing in a circle. Each is given the name of a different flower. A player is chosen to go to the middle of the circle. He says, " I enter the flower garden and want a rose and a lilac". The players with these names must then change places with each other. While they are changing places, the player in the middle tries to get a vacant place. The player left without a place must then go to the middle of the circle and repeat the process. This can be adapted to birds names and other areas if desired.

Game - Bird, Beast, Fish (Animal Recognition)

A player chosen to be IT stands in front of the class. He calls out a player's name and then says, "Bird, beast, fish---beast". Then he starts counting to ten. Before he finishes the count, the player whose name he called must name a beast that has not been named previously. If he can do this before IT can count to ten, he becomes the new IT. If he fails to do so, IT calls on another player to name a bird, beast and fish in the same manner. This game can be adapted to "things found in the outdoor school area".

Art - In the Outdoor Classroom

Materials - 1 piece of drawing paper and 1 crayon per child

Place a leaf under the drawing paper and gently rub over the leaf with the crayon.

Overlapped rubbings may create a design. Single rubbing will outline leaf and veination. Different kinds of leaves may be used in one design.

Designs may be repeating or non-repeating, single color or many colors.

Bark rubbing and a leaf may be put together.

Art - In the Outdoor Classroom

Materials - cellephane tape -- 1-9"x12" construction paper -- 1 crayon per child

Secure the leaf on the paper with cellephane tape. With crayons, the child adds head, legs, feet and arms.

CREATIVE ARTS

Grades K-1

Movement - The Wind

The weather and its changes are of great interest to a small child. It is good to talk about the weather to help increase the child's awareness of the various changes. The Wind especially lends itself to rhythmic activities. The Wind is rhythmic, It is always moving. We can't see the wind, but we can see what it does: it blows things through the air. It blows leaves, paper, weeds, sand. What else does it blow? The Wind blows through the trees and makes them shake. It makes a wooshing sound when it blows through the trees. The leaves shake in the wind and make a rustling sound.

Movement - Activities In The Wind

1. Be the wind and blow everything out of the way.
2. Make a small wind by blowing with your mouth.
3. Take heavy and light things outdoors and see which blows away the quickest.
4. Take something wet outdoors and see if it dries faster in the wind.
5. Make a kite and fly it. Make wind - flowers out of tissue paper shapes tied around the middle with yarn. Also crepe paper streamers.
6. Observe the clouds as they move across the sky.

Wind - Song - Flying Through the Air (sung to Mary Had A Little Lamb)

The wind is blowing all around, all around, all around,
The wind is blowing all around, all all around the air.
The leaves are flying all around, all around, all around,
The leaves are flying all around, flying through the air.

Wind - Song - Clouds Are Floating (sung to Fere Jacques)

Clouds are floating,
Clouds are floating
Up so high,
Up so high
Floating up above us,
Floating up above us,
In the sky, in the sky.

The Wind and the Clouds (dramatic)

A storm was coming. The wind was blowing hard, It was swooshing and wooshing through the trees. The clouds were getting dark and heavy. The wind was blowing the clouds all around. It was blowing and dark and stormy. Woooo -- woooo - wooog -- woooo (repeat last 2 lines once or twice more).

Movements - Spiders

To find out about spiders is a favorite love of little kids. Spiders can be observed for movement patterns. Do spiders have knees? Their legs are very long for the rest of their body. They look almost as though they don't have any knees. Notice that they have 6 legs.
Chant: The great big spider is on the ground,
The great big spider is walking all around, walking all around, walking all around.
The great big spider is walking all around.
What other kinds of bugs walk around the ground: Do they have six legs?
(Child can imitate movements.)

Movements - Worms

Find some earthworms to bring to class. Discuss how they move and live - they have no eyes. They move by wiggling their bodies. They live under the dirt. They dig tunnels through the dirt. They dig the tunnels by eating the dirt. What does it feel like to live in the ground? Is it cold or warm? Is it dark? What does it feel like to move without having any legs?

"Let's all get down on the floor and see what it feels like. Let's all pretend to be worms. Who can wiggle like a worm? Wiggly, wiggly worm - crawling all around us."

Chant to go with Worm Movement

Worms are crawl-ing, crawl-ing, crawl-ing,
Worms are crawl-ing, crawl-ing all around or making tunnels in and out of the ground.

Song - Wiggly Worms (tune-Farmer in the Dell)

Wiggly, Wiggly worms - are squirming all around.
Wiggly, squiggly, wriggly worms,
Crawl in and out of the ground.

Rhythm Interpretation - Nature

Different type songs will be played to demonstrate the following games. The children will be given directions for each:

1. Falling leaves
2. Squirrels
3. Ducks
4. Turkeys
5. Rabbits
6. Butterflies
7. Flying birds

Color Hike - Nature

Make a large color wheel including browns, tans and grays. Go on a hike and bring back "nature's discards" of all colors. (This is a good place to teach conservation practices in collecting material.) Match objects to selections of the color wheel.

A variation would be to assign a color to one or two members of the

(Color Hike - cont.)

group; let each team carry their color from the color wheel with him and collect several objects of that color.

Game - Wind and Flowers

The players are divided into 2 equal teams. The Wind and the Flowers. The teams assemble at goal lines about 25 yards apart. The Flowers chose the name of a flower and go over and stand in front of the Wind. The Wind players try, in turn, to guess the name of the flower. When they guess correctly, they chase the Flowers back to the goal line. Any Flower tagged becomes a member of the other team. Later the teams exchange names and the new Flowers have to think up a name for the new Wind to guess. The first several times this game is played, it would be advisable to have the players walk fast instead of run. Stress running in a straight line to avoid collisions. Can be adapted for bird names also.

CREATIVE ARTS

Grades 2-3

Rhythms -

Take turns being "drummers" in the Tribe. The rest are Indians who dance the rhythm. Dance rules are simply to change lifted foot with every beat. Arm movements and body movements are optional, but each beat must be "stomped".

Rhythm - In the Outdoor Classroom

Locate a spider. Watch the rhythm of her movements. Try to tap a rhythm that matches. This is particularly good fun if the spider is making a web. Younger children may want to sway their bodies to the swinging motion of the spider.

CREATIVE ARTS

Grades 4-5-6

FAST, SLOW, HIGH AND LOW

This lesson is used to show children the different sound patterns in nature.

1.
Tap or clap the lines in row 1. Make sure that all taps are steady and even.

If you walk twice as fast as you did at first, the movement may be shown this way, a shorter line for each step:
2.
Tap the lines in row 2. Make sure that all taps are steady.

Find a partner and take turns tapping the lines in row 1 and row 2. Remember that the taps for the shorter lines in row 2 will go twice as fast as the taps in row 1.

Make up patterns using long and short lines. Choose one of the patterns and tap it for your partner. Ask him to tap it back for you.

Write the pattern you think your partner is sending to you. Use the long and short lines. Ask him to repeat the pattern, if necessary. Then compare what you wrote with the message he had written down to send you. Make your patterns short at first. As you improve, make your patterns longer.

You can send your pattern, using a voice sound. For example, if your pattern is _ _ _ _ ___ ___, you might signal it like this:

Beep Beep Beep Beep B E E P B E E P

Again, use longer and shorter lines to make other patterns and to record your partner's patterns as he sends them. Later, you and your partner might try sending your patterns over longer distances. You can do this by beating hollow logs with sticks or by striking a piece of metal with a rock or another piece of metal.

Outdoor areas are often filled with bird sounds. Some bird sounds are like tunes and others like cries of alarm. Still others are just the noises certain birds make as they work (woodpeckers). Partridges make rhythms by beating their wings in the air. Crows "caw" and owls "hoot". The results are calls rather than tunes.

But many birds have songs. Some of these are simple and some are complex. Those who have heard a quail know his song. Many people

FAST, SLOW, HIGH AND LOW (cont.)

call a quail a bobwhite because they think his song sounds as though the bird is saying:

Bob Bob White

The rhythm of the quail's song can be show this way:

— — ——

The tune of the quail's song can be shown this way:

— — ——

Notice that the first two pitches are the same. Notice, also, that the third pitch is higher.

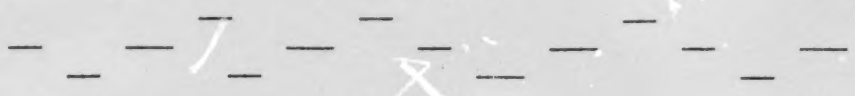
How do you say "Peter Jefferson:? Tap the rhythm pattern. Is there a change in pitch as you say the name? Here is one way to write the rhythm pattern and the pitch pattern for "Peter Jefferson":

Jef-
Pet-er er-son

Write the rhythm pattern and the pitch pattern of your own name. Try writing the patterns of short phrases like:

No trespassing
Come and get it

A man named F. Schuyler Matthews investigated bird music and collected the songs of birds. He shows one robin tune as:



Listen to a bird song and try to write down how it sounds, using short and long lines and showing the pitches by making the lines higher or lower.

You might want to make a project of collecting bird songs. Learn the name of the bird and listen for all the songs he has. Collect as many for each bird as you can. Keep a record of the bird and his songs.

TREE TEXTURES

One way to preserve the patterns seen in nature is to make drawings and photographs. This lesson gives instructions to children for other fun ways of preservation of patterns.

One way to preserve the pattern of bark is to make a rubbing. Use

TREE TEXTURES (cont.)

thin, plain paper, such as typing paper. You will also need a thick crayon. Place the paper against the bark and rub the paper carefully and evenly with the crayon. Label each rubbing with the name of the tree and where you found it.

A way to preserve the pattern of leaves is to make leaf prints. Collect the leaves you'd like to use. If you like, write down the name of each leaf and where you found it.

Rub the surface of the leaf with a little shoe polish paste. Then place it on a sheet of paper, polish side down. Put another sheet of paper over it. Press the "sandwich" firmly with a roller or with the heel of a large spoon to make the print.

Try this with a collection of leaves. Some could be overlapping. Experiment and find the many results you can have.

Still another way is to place a leaf or an arrangement of leaves on a smooth surface. Cover them with a sheet of paper and rub with colored chalk or crayons. Using different colors gives various effects. So does rubbing on the same page over two different leaves at different times, using a different color each time.

Another way to preserve nature's patterns is to press a piece of modeling clay against the bark of a tree. Then carefully pull the clay from the bark and set it on a flat surface. You now have the texture of the bark on the clay.

Build a dam around the clay with greased cardboard. This is a material that plaster will not stick to. Then pour soft plaster on the clay. After a few days, remove the plaster cast from the clay. Paint the cast with the bark texture the same color as the real bark.

LANGUAGE ARTS

Grades K-1

Nature

Prior to taking a field trip, tell the class that when they return to their room they will develop an experience chart on which they will categorize under the 5 senses the things they experienced on the trip. They will also be asked to identify words which will describe their observations of other sense experience:

What words can be used to describe a forest or tree?
The actions of a bird?
The odor of a flower?
The feel of wet moss?
The smell of pine needles?

The activity might be culminated with a group writing effort to describe as vividly as possible some of the highlights of the field trip.

Animal Poem - Little Birds

All the little birds
Are asleep in their nest,
All the little birds
Are taking a rest.
They do not even twitter
And they do not even tweet,
Everything is quiet
All up and down the street.
(the above may be repeated for longer rest)

Then came the mother bird
And tapped them on the head,
They opened up one little eye,
And this is what was said,
(a child or teacher may be the "mother bird")
"Come little birdies it's time to learn to fly
Come little birdies, fly way up to the sky"
Fly, fly, oh fly away, fly, fly, fly,
Fly, fly, oh fly away, fly away so high.
Fly, fly, oh fly away, birds can fly the best.
Fly, fly, oh fly away -- now fly back to your nest.
(Repeat as many times as needed for activity -
if desired, the first part only may be used --
for resting, without flying)

Animal Poem: Flap Your Wings

Unfold your wings little butterfly,
Look up and see the wide blue sky,
Flap your wings back to and fro,
Flap them again --- and away you go!!

Animal Poem: Spinning My Cocoon
(song - tune to Row, Row, Row)

Spin, spin, spin my cocoon,
Spin it all around.
Spin it, wind it, spin it, wind it,
Round and round and round.

Animal Poem: Caterpillar

Oh, Mr. Fuzzy Caterpillar walking down the street,
Why do you crawl if you have so many feet?
Oh, Mr. Fuzzy Caterpillar crawling in the sun,
With so many feet, why can't you run?
Run, run, run, run, run, run, run,
Oh, Mr. Fuzzy Caterpillar, run, run, run, run.

Animal Song: Bees (tune to Fere Jacque)

Bees are buzzing, bees are buzzing,
zzzzzz!! zzzzzz !!
Bumble bees are buzzing, honey bees are buzzing,
zzzzzz !! zzzzzz !!

(Bees like to fly with butterflies. There are 3 kinds of bees: honey bees, worker bees and bumble bees. Which kind are you?)

Movement: Birds

We like to talk about birds, observe how they live and fly like birds. How do we tell if something is a bird? It has feathers. No other living creatures do.

Some birds sing beautiful songs. Some birds make other kinds of noises but do not sing songs. The crow says, "Caw-caw-caw". What other kinds of sounds do birds make? What kinds of sounds do baby birds make?

Can all birds walk? How many legs do birds have? Do they have arms?

Movement: Birds (cont.)

What do the birds use their wings for? Can all birds fly? What kind of bird cannot fly? What are some of the birds that can fly? What is the biggest kind of bird we know about? What is the smallest kind of bird? What do birds eat? Where do they live? Where do baby birds come from?

Birds: Flying Activities

Often when the children are flying they want to continue the activity. It can be varied by considering what else flies - bees, butterflies, other insects and other non-living things (planes, helicopters, etc.)

Pictures from home, story books, picture books, poems - all will contribute to background information and ideas for rhythmic flying activities. Use the sports glasses and cameras.

ANIMAL RHYME QUIZ:

I am thinking of an animal
Her color is brown and white
over her body she has splotchy spots
And her neck is quite a sight. GIRAFFE

I am thinking of an animal
Who is wild as wild can be.
She looks like a horse
With stripes you can see. ZEBRA

I am thinking of an animal
Her color is just white
Her fur is soft and furry,
and her size is out of sight.
She lives in the cold weather
in the ice, sleet and the snow,
she is big and growly all the time
of this I sure do know. POLAR BEAR

I am thinking of an animal
Who is small, fleet and fast.
She climbs from tree to tree,
you can hardly see her pass.
Her tail is long and bushy,
It can be in brown or grey
She likes to eat her nutty nuts
She looks for every day. SQUIRREL

ANIMAL RHYME QUIZ (cont.)

I am thinking of an animal
Who is covered with many spots
She roars and roars
in a great big voice
And likes to climb trees a lot. LEOPARD

I am thinking of an animal
He has four long legs,
he has a funny bearded chin,
and eats everything he begs. GOAT

I am thinking of an animal
His legs are short and squatty
His skin is very tough indeed
It's found all over his body. HIPPOPOTAMUS

I am thinking of some animal
Who flies up in the air
Two wings help them do this
and feathers they do wear. BIRDS

I am thinking of an animal
who has a hard, hard shell
He walks so very slowly
and does not go pell mell. TURTLE

I am thinking of an animal
He has two funny legs
But with his legs he does not walk
He hops with them instead. FROG

I am thinking of an animal
Who has some long, long stripes.
His color is orange and black,
and his temper is not right. TIGER

I am thinking of an animal
Her home is in the woods.
She runs as fast as anything,
with a white flag up in the air. DEER

I am thinking of an animal
Her size is very small
She makes a quiet squeaky noise
and is hardly here at all. MOUSE

ANIMAL RHYME QUIZ (cont.)

I am thinking of an animal
Who hops and hops and hops.
Her ears are something special too,
For longness they are tops. RABBIT

I am thinking of an animal
His color is just black
He lives in cold, cold water.
And he travels in a pack. SEAL

I am thinking of an animal
He has a pair of wings.
He cannot fly a bit at all
Even though he does have wings. PENQUIN

I am thinking of an animal
Who gobbles all day long.
He is covered all with feathers
Until they are all gone. TURKEY

I am thinking of an animal
With a stripe of black and white
He lives up in the woods
And his smell is very ripe. SKUNK

I am thinking of an animal
His family is called birds.
The sound he makes is whoot, whoot, whoot,
And his home is in the woods. OWL

I am thinking of an animal
Who wears upon his face
A bandit's mask that is black
And eats fish that's to his taste. RACCOON

I am thinking of an animal
His color is all red
With a tail that is so bushy
And in the woods he makes his bed. FOX

LANGUAGE ARTS

Grades 2-3

Outdoor Classroom:

Twigs can be assembled for a (unlit) campfire which the children sit around. Teacher assumes the role of Indian story-teller or Eskimo story-teller or whatever to read a story. The "play acting" improves their attention and interest.

SOCIAL STUDIES

All Grades

Social Studies:

1. The outdoor classroom is a great place to play act the First Thanksgiving (after they have read about it, of course.)

2. Why not take the text books out to the classrooms? Especially good -- pioneer life, westward expansion, early explorers.

MATH

Grades K-1

Nature: The Shapes of Nature

Let each student construct basic shapes out of cardboard - square, triangle, circle, rectangle. Carrying these with them for a walk around the school yard or in a field or woods, have the students identify these basic shapes as they occur in nature.

MATH

Grades 4-5-6

HOW HIGH IS THAT?

This is a lesson to teach students to estimate the height of tall objects.

One method used to estimate heights is based on the use of similar right triangles. You will use a stick about two inches longer than your height. Find a tree you want to measure. Put the stick straight up in the ground. Then lie down with your feet against the stick and look up at the top of the stick.

The trick is to be at a certain distance from the tree so that the top of the stick and the top of the tree are in line with your eyes while you are in a lying-down position. If they are not, move toward the tree or away from it. When you have found the spot where your eyes, the top of the stick, and the top of the tree are in line, the rest is easy. Measure the distance from where your head was to the bottom of the tree. This distance equals the height of the tree.

Certain American Indians used a similar method to measure the height of an object. A person would stand with his back to a tree and a few paces from it. He would then bend forward until his head touched the ground. And in that position he would look backward through his legs.

If he could see only the middle of the tree, he would move farther away and try again. When he could just see the treetop in this crazy position, he could figure out the height of the tree. The height would be about the same distance that he stood from the tree. He would then count the paces back to the tree, and this measurement would equal the tree height.

NATURE'S PATTERNS

Many different shapes and designs and patterns exist in nature. One of the most common patterns is the spiral. Look for the spiral in plants, animals and non-living things. Spirals may be found in snails, shells, pinecones, animal's horns, and tendrils of vines. Other patterns to look for are triangles, radials, circles, spheres, concentric circles, dendritic patterns (teeth) and hexagons. Have the students keep a chart of the examples they found.

SCIENCE

All Grades

Science - Living things are interdependent with one another and their environment.

Toothpick Activity:

Purpose - To help kids understand the results of protective coloration.

Serve 50 colored toothpicks in each of the following colors: red, blue, pink and green. In an area of about 10x15 ft. on the grass surface of the school grounds have 2-3 kids put the toothpicks so that their tops do not show above the level of the grass. Have a small group of kids (3-4) pretend they are birds looking for insects (the toothpicks) and see how many they can find in 5 minutes.

Discuss:
1. Why they found fewer green toothpicks.
2. What color insects are safest from birds.
3. Does the time of year make a difference in desired coloration for protective purposes.
4. How important is color in nature?

Science:

Issue binoculars and outdoor classroom cameras with instructions to take a picture of a specific thing such as a bird, an insect, a flower, an animal track, a gopher hole, etc. to pairs of students. Where possible, ask them to study the object under magnification.

Terrarium:

Materials: brandy snifter, fish bowl, large bottle or some similar container
sheet moss
clean gravel
potting charcoal
potting soil (must be sterile soil)
plants (must be compatable)

Procedures: Line bottom and sides of container with moss, green side out. Make this pocket ¼ the height of the container. Add a layer of clean gravel (approx. ½"). Add a layer of potting charcoal (approx. ¼"). Add potting soil, filling to the top of the pocket and

Teaching About Air in the Kindergarten (cont.)

2. Materials: Balloon inflator from 5&10 (a cardboard cylinder within a cylinder), candle.
   Procedure: Take inflator apart to show them the inside. Ask them what is in it. Put it back together and pump it near lighted candle.
   Result: The candle will go out. (Also, the children can hear the air come out of the inflator. Let them feel it.)
   Conclusion: The cylinders were filled with air. When the cylinders were compressed, there was less space and some air had to come out.

3. Materials: Soda bottle, funnel with small hole, plasticene, cork to fit bottle, water.
   Procedure: Make a hole in the cork to fit the funnel tube. Put cork and funnel into mouth of bottle. Seal cork and funnel with plasticene so that they are airtight. Pour water into funnel quickly but gently.
   Result: Water will stay in funnel.
   Conclusion: Air in the bottle could not get out to make room for the water so the water could not go in. (Caution: If the bottle is moved or the water jiggled, air will start to leak out and water will go in, in the same amount as the air that comes out.)

II. Concept: Air pushes in all directions.

1. Materials: Empty plastic liquid detergent bottle, water.
   Procedure: Punch small hole on side of bottle near bottom. Holding finger over hole, fill bottle with water and screw cap on. Alternately remove and replace cap.
   Result: When cap is on, water does not flow out through hole. When cap is removed, water flows out.
   Conclusion: Air pushing on side of bottle holds water in when cap is on. When Cap is removed, the weight of the water plus the downward pressure of air on top of the water forces the water out through hole.

2. Materials: Glass, water, piece of paper slightly larger than mouth of glass.
   Procedure: Fill glass with water. Cover mouth of glass with paper. Holding paper in place, (a) turn glass upside down; (b) turn glass on its side.
   Result: Paper will stay in place and water will not flow out.
   Conclusion: Air pushing on the paper kept the water in the glass.

3. Materials: Juice can with two holes punched in top, water.
   Procedure: Fill juice can with water.
   (a) Cover one hole with finger and turn can upside down.
   (b) Remove finger.
   Result: (a) Water will not flow out.
   (b) Water will flow out.

Terrarium (cont.)

then landscape the area: e.g. hill and valley. Planting is next. Using a spoon or pointed stick, open a place for each plant, set it in and press the soil back around the roots. Lightly water each plant with room temperature tap water. DO NOT over water. Close the container. If too much water accumulates in the jar, it can be opened for short periods of time. Keep terrarium anywhere in the indirect sunlight.

*TEACHING ABOUT AIR IN THE KINDERGARTEN

Air is real!

We feel it when the wind blows.
It can spin a pinwheel and a weather vane.
It can move a sailboat.
It can fly a kite.
It can dry the clothes.
It can carry seeds.
It can move sand and papers and trees and many other things.
It moves clouds.
It keeps fires burning.
It holds up our automobiles and bicycles.
When it is moving very fast it can push us.
It helps to keep us alive.

Some concepts about air that kindergarten children can understand:

1. Air takes up space.
2. Air pushes in all directions.
3. Air can lift things and hold things up.
4. Air pushes but doesn't like to be pushed.
   (In adult language, "Air resists objects passing through it.")
5. Air is elastic; it expands and contracts; sometimes it takes more room than at other times.
6. Heated air goes up.
7. Air has weight.
8. Air has water in it.
9. Fires need air to burn.

I. Concept: Air takes up space.

1. Materials: Glass, large bowl of water, handkerchief or paper napkin.
   Procedure: Fill bowl with water. Stuff napkin into glass. Turn glass upside down and holding it perfectly straight, push it into the water. Still keeping it straight, lift it slowly out of the water.
   Result: Napkin remains dry.
   Conclusion: The air in the glass did not make room for the water.

(*From: Kindergarten Curricular Guide, Montclair, NJ)

Teaching About Air in the Kindergarten (cont.)

Conclusion: (a) Air pressing against hole held water in.
(b) Air entering can through one hole plus the weight of the water made the water go out the other hole.

4. Materials: Glass of water, straw, food coloring.
Procedure: Put straw in glass of colored water.
(a) Cover exposed end of straw with finger and remove straw from water.
(b) Remove finger from end of straw.
Result: (a) Water will stay in straw.
(b) Water will fall out of straw.
Conclusion: (a) Air pushing on bottom end of straw held water in.
(b) Air pushing down plus weight of water forced water out.

III. Concept: Air can lift things and support things.

1. Materials: Heavy book or brick, balloon or grocery bag.
Procedure: Lay balloon on table with open end sticking out over edge. Place book on top of it. Inflate balloon.
Result: Book will rise.
Conclusion: Air in balloon lifted the book. Air can lift heavy things.

2. Principle of the airplane.
Materials: Piece of notebook paper about 8"x1¼".
Procedure: Hold paper just under lower lip. Blow.
Result: Paper will rise.
Conclusion: Air moving fast horizontally does not press down as hard as the air that is pressing up. The air coming up and hitting the under side of the paper is pushing harder and holding the paper up.

IV. Concept: Air pushes but does not like to be pushed (air resists objects moving through it.)

1. Materials: 3 identical pieces of paper (9x12 is a good size.)
Procedure: Crumple one piece of paper into a ball.
(a) Standing on a chair, drop the ball and one piece held horizontally at the same time.
(b) Drop one piece horizontally and one vertically.
Result: (a) The ball falls faster.
(b) The vertical piece falls faster.
Conclusion: The horizontal piece of paper had a larger surface held up by air and had to push more air aside as it fell.

Teaching About Air in the Kindergarten (cont.)

IV. Concept (cont.)

2. The Parachute

Materials: Large handerchief, 4-12" pieces of string, large cork.
Procedure: Tie strings to each corner of the handerchief. Tie other ends to cork. Hold handerchief by by center. Drop from a high point.
Result: It will fall slowly.
Conclusion: Air is holding it up.

V. Concept: Air expands and contracts; it is elastic.

Materials: Large flask or Pyrex baby bottle, Bunsen burner or alcohol lamp or candle, balloon.
Procedure: Fasten balloon securely over mouth of flask.
(a) Heat flask.
(b) Remove heat.
Result: (a) Balloon will blow up.
(b) After a short while, balloon will go down.
Conclusion: (a) Warm air takes up more space and the only place it could go was into the balloon because the balloon is elastic.
(b) When air cools it takes less space so the air went back into the flask.

VI. Concept: Heated air goes up.

Materials: Piece of paper 4 inches square cut into a spiral, piece of thread, heat.
Procedure: Fasten thread to one end of spiral.
(a) Suspend it in the air.
(b) Hold it over something hot (radiator, hot plate, candle, etc.)
Result: (a) Spiral will hang fairly still.
(b) Spiral will spin and dance.
Conclusion: Air above heat is hot and going up. As it goes it hits the spiral and makes it spin and dance.

VII. Concept: Air has weight.

Materials: Drinking straw, thin string, two balloons the same size, two tiny rubber bands.
Procedure: Blow up both balloons and fasten with rubber bands. Suspend one from each end of the straw. Suspend straw by string from a point near the center of the straw. Balance the balloons. (Since this is a very delicate experiment because the air is so light, I used a plastic straw and fastened

Teaching About Air in the Kindergarten (cont.)

VII. Concept (cont.)

all strings by putting them through holes in the straw with a needle. An extra string fastened to one end in the same way can be the balancing mechanism - cut it until the balloons balance. If any of the strings move even slightly to one side on the straw, the experiment will be accurate.) Loosen the rubber band on one balloon and let the air out. (leave the rubber band on).

Results: Balloon still filled with air will go down.
Conclusion: Since the balloons no longer balance, the air weighed something.

VIII. Concept: Air has water in it.

Materials: Glass jar with screw cap, ice cubes, water.
Procedure: Fill jar with ice cubes and fill spaces around cubes with water. Screw cap on tightly. Wipe outside of jar so that it is perfectly dry.
Result: After a short time, outside of jar will be wet.
Conclusion: No water spilled so the water on the outside must have come from the air (air will condense on a cold surface).
Note: If the day is not humid, there will be no apparent condensation.

IX. Concept: Fire needs air.

Materials: Birthday candle, candle holder, plasticene, glass jar and metal cover that is too large for it.
Procedure: Put lump of plasticene in jar cover; insert candle holder and candle. Light candle. Place jar over candle.
Result: After a short time, the candle will go out.
Conclusion: When the flame used up the oxygen in the air, the candle went out. Fires cannot burn without air.
Note: This can be repeated several times by dramatically refilling the jar with air and relighting the candle.

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WATER

Scientific Concepts To Be Explored

Rain is water
Rain appears and disappears
Rain makes noise
Rain forms puddles, brooks, rivers, lakes, oceans
Rain comes from clouds
Rain makes soil moist
Rain washes soil away
People, plants and animals need water
Some things live in water
Water is used in our homes for many things
Water may be dangerous
Water may be fun
People and things travel on water
Drinking water is carried in pipes
Some things are soluble in water
Some things float in water
Some things sink in water
Ice is frozen water
Water reflects
Water can be changed to another form

Possible Observations and Experiments

Water level changes in an aquarium
Evaporation of water observed from:
- Washed table tops
- Wet sponge marks on blackboard
- Wet paint brush picture on blackboard
- Two equally full glasses of water - place one in warm place; one in cold place

Drying of:
- Paint pictures
- Washed doll clothes hung on line in room

Disappearance of mud puddles
Cooling of hot objects with water
Warming of cold objects with water
Washing of hands for hygienic reasons
Appearance of objects magnified by water
Looking at clouds before a storm
Drinking places found by wild life, birds
Feeling rain on hands and face
Watching for a rainbow after a rain
Looking at the dew on a spider web and on the grass
Sleet:
- Beating on a window pane
- Stinging one's face
- Blurring vision on windshield

Hail pelting ground and disappearing
Placing cut flowers in water
Placing twigs of trees and shrubs in water in late February
Placing water in a container to watch birds drink, wash, preen their feathers

Water (cont.)

Catching and measuring rain
Freezing water outside in tin can and in sealed glass jar
Melting snow and icicles in classroom
Expansion of liquids under freezing conditions: ice, milk, soda
Snow takes up more space than water
Water changes things: salt, sugar, jello, soap
Blowing soap bubbles using soap, water, straws, discarded milk cartons
Watering sand or dirt makes molding possible
Discovering that some objects sink and others float
Moving water carries objects: seeds, wood, leaves
Moving water makes gulleys in sand, dirt, or rock

Science - Outdoor Classroom

In the outdoor classroom, observe several abandoned bird nests from the ground. Shake the tree (with reasonable vigor) trying to dislodge the nest. Now try to build a nest that will stand up tp tree shaking as well.

Note that weaving the twigs is permitted.

Birds without fingers weave a neat nest!

SCIENCE

Grades K-1

Various Activities to Do In the Outdoor Classroom:

1. Care of pets, fish, silkworms, etc.
2. Collecting seeds, stones, cocoons, leaves, etc.
3. Plant bulbs, seeds, cuttings.
4. Observe and chart the weather.
5. Observe seasonal changes and their effects on people and animals.
6. Prepare simple foods such as popcorn, make butter, roast peanuts, etc.
7. Experiment with magnets, steam, air, salt, etc.
8. Classification of materials.

Nature Contributions:

Once children learn the teacher welcomes contributions of specimens and that classmates are interested in what they bring, children respond by making every effort to bring interesting objects of nature into the classroom. The teacher will provide the environment for specimens and be responsible for making these ongoing experiences. The classroom can become the home for a variety of nature's small creatures - pollywogs, lizards, horned toads, turtles, cocoons and chripalisis, butterflies, moths, silkworms, etc. It is important to provide time in the daily program when the kids can leisurely observe and make discoveries about these specimens.

Game - Weather Bureau

A player chosen to be The Weather Bureau calls out which way the wind is blowing. All the other players must face in the direction The Weather Bureau says the wind is blowing. Players who face in the wrong direction are out of the game. If "tornado" is called, the players must pivot around several times. After the game has gone on a short time, a new Weather Bureau is chosen.

Game - Animal

A player chosen IT stands in front of the other players and imitates an animal. When somebody correctly guesses the animal imitated, he chases IT to a designated goal. If IT reaches the goal without being tagged, the player who tags him becomes IT.

Poem - Flower Seeds

All the little flower seeds sleep in the ground.
Warm and snuggly and tucked in all around,
Sleeping oh so soundly the long winter through.
There really wasn't very much else for them to do.
There really wasn't very much else for them to do.
(repeat above 5 lines)

Now their eyes they opened and they peeked all around,
And started to grow right up through the ground.
They grew so very slowly, but they grew straight and tall.
And their leaves they unfolded and waved at us all.
And their leaves they unfolded and waved at us all.

Then the sun shined down and made the flowers smile,
And they swayed and swayed in the breeze for a while,
Until a big wind came and blew them all away
And there were no more flowers that day.
"Blow, blow, blow away flowers,
Blow, blow, away."

Variation: For a longer rest period, the seeds may be watered by Farmer, the Rain may fall, and the Sun can warm the ground before the flowers peek through.

Nature:

During a nature walk, have the kids quietly observe animals (insects, worms) in nature. Encourage the students to try to "guess" what the animals are doing. In a following discussion (in the classroom or in the field), have the kids name all the things an animal needs in order to survive -- include food, air (oxygen), protection (shelter), etc.

Man too is an animal. Does he need the same things?
Besides these items, what else does man need?
Does he really need them or would man just like to have them?
Name items that man may want - include friends, love, color TV sets, etc.
Decide which things are most important to us as individuals. Do all agree?
Why does man want so many extra things?
Do these things make him more comfortable?
Differentiate between surviving and quality of life.

Ecology

Ask the kids to report to their classmates on undesirable things they have seen children do around the school such as discarding

Ecology (cont)

trash in wrong places, damaging bushes and plants, defacing walls and making excessive noise. What can they "undo"?

Follow up the showing of things not to do with puppet skits in which kids act and talk about the things they and their friends should do if they want a more beautiful school and home.

Nature - "Feely Box"

Construct a "feely box" by cutting one end from a shoe box and covering the opening with a piece of cloth (a large paper bag may also be used). Place a nature object in the "feely box" without the students seeing what the object is. Have each student feel the object and describe it in as many ways as possible. Objects that may be used include: stones, soil, leaves, twigs, grass, moss.

This activity may be done with several students at the same time using several "feely boxes" or letting all of the students except one see the object before it is placed in the box and then having the one student describe it.

Ecology - Water Pollution Treatment

Procedure: Pour water into seperate containers through the filtered shaped funnel. Put the aerator tube into this filtered water for about 1 hour: 24 hours. Note any change in appearance or odor. Let the kids make predictions before and after each step.

Conclusions: What are their conclusions about the effects of settling, filtering and aeration on the appearance and odor of the water?

Ecology - Water Pollution

Materials: 1 quart of soapy dish water and 1 quart of tap water.

Procedure: Note the appearance and odor of both samples at the start. Put in a quiet area out of the sun. Let the students guess what will happen to each sample in an hour and by the next morning. Then note the appearance and odor of each sample at the suggested time intervals.

Conclusions: Did they guess right? Has anything settled out? What does this mean to the whole community? Do they think dish water is good for people to drink?

Water Pollution Treatment

Material: The above samples of soapy dish water and tap water, filter paper or paper towels, funnel, aerator from a fish aquarium and an empty container for each sample.

Bird Related Activities:

1. Keeping a class record of birds identified.
2. Making a scrapbook of bird pictures and drawings.
3. Telling a story about birds at the bird feeder.
4. Making bird feeders to take home.
5. Collecting natural food for the bird feeder.

Purpose: To observe birds at feeder. To verbally describe birds as to general characteristics - color, shape, size and to identify some common species.

Establish a bird feeder within view of the classroom window. At regular intervals during the day allow small groups of students to observe the firds feeding and discuss with these students some general characteristics. Ask questions such as:

1. How are all birds alike?
2. What is the color and size of a particular bird?
3. How do the legs and toes differ with birds?
4. How do the birds behave at the feeder?
5. Is there a variety of food available for the birds? Do some birds prefer certain seeds?
6. Can some of the birds be identified from a bird chart?

SCIENCE

Grades 2-3

Food Web

Each child takes the name of a plant, herbivore or carnivore native to the area (insects, birds, decomposers should not be left out). Start anywhere by giving a student a roll of string. Ask the question, "What eats this?" After the group identifies the answer, run the string to the next player. Questions may need to include, "Where does this get its energy?" Or, "What would be affected if this died?", etc., as the string weaves from one to the other.

When the string runs out, discuss any missed connections. Then have one student let go of all his strings. See the web sag. Have that student carefully re-wind the string, noticing how just the one "drop-out" affects the overall web.

SCIENCE

Grades 4-5-6

Collecting Soil:

Collect samples of soil from different locations and examine them for differences and similarities.

Wind Velocity:

Wind velocity may be measured by using a piece of material and sewing it into the shape of a flag. Different degrees of wind speed may be measured by how far the flag sticks out horizontally.

Rain Guage:

Use a rain guage to determine the daily rain fall. Find one student to check the rain guage daily at the same time every day. Chart and graph this information. Totals may be made for each month.

Weather Chart:

Keep a daily weather chart for the year. Include outside temperature, cloud formations, wind velocity, and if it is raining. Try to find a pattern of the cloud formations associated with rain. Make a monthly average of the temperature and graph the curve of the temperature.

Autumn Leaves:

Collect different kinds of leaves in the fall. What do they have in common and how are they different? Sketch the shape of the leaf with the tree it came from.

Watching Things Change:

All things change with time. Natural communities change in a gradual and orderly way.

Changes take place so slowly that you hardly notice them. But if you returned to your study area many years later, you might be startled by the changes. The pine forest might have been replaced by the oak forest.

The gradual replacement of one community by another is called SUCCESSION. Nature creates the conditions for change.

Try to decide if the outdoor classroom is being replaced by another type of forest. You can tell by comparing the leaves of the very young trees to the older trees.

Watching Things Change (cont.)

Take a picture of your area from a particular place. Next year, the new class can take a picture from the same spot. In ten years you will have a picture record of the changes in your outdoor classroom.

Adaption:

Children study plants and animals in the outdoor classroom, looking especially for ways in which they are adapted to live in a special environment.

Adaptation means fitting into, or an adjustment to conditions of an environment.

What's Alive in the Soil?

Find different areas outside that appear to have different kinds of soil. Collect some of the soil from each of these areas on a large piece of paper. Examine the spot carefully, watching closely for living things. Use a magnifying glass for small living things. Try to count the animals belonging to these groups: worms, grubs, snails, spiders, other.

Making Splash Boards to Study Splash Erosion

Get two boards 1 inch thick, 4 inches wide, and 3½ feet long. Sharpen one end of the board and paint the boards white. Mark lines across the boards at 1-foot intervals beginning at the unsharpened end. Attach tinshields about 4 inches wide and from 8 to on inches long to the tip of each board to prevent rain from washing off the splashed soil.

Locate 2 spots with very different amounts of grass cover. Drive the sharpened boards into each of the 2 spots to a depth of 6 inches. Leave them there and observe them after the first rain. After the rain, note the difference in the amount of soil splashed and the height it is splashed on each board.

Plant A Tree:

Plan in advance the kind of tree you are going to plant and where they will be planted. Take into consideration the soil and moisture conditions and how the trees will be used.

Take the tree from its container and set in a hole no deeper than it grew in the nursery. Tap the soil thoroughly around the roots. Water thoroughly. Make sure to care for the tree in future years.

SCIENCE

Grades 4-5-6

*ON CAMPUS TEACHING ACTIVITY GUIDE

Insect Census #182

Compute a census of the population of selected insects on the school grounds. Compare a grid system of the school grounds and collect data from a random grid sample. (1) Count numbers of mole cricket runs on ground. (2) Count antlion funnels in sand. (3) Count ants. (4) Number of mosquito larvae on water surfaces, etc. In which types of habitat (grassy, sunny, open, wet, damp, etc.) are each of the animal types most abundant?

Where Do the Insects Live? #183

Obtain several sheets of fly paper or paint a mixture of fermented fruit and molasses on cardboard sheets. The students should choose as many different areas on campus as possible to place their sticky traps. Whenever possible, one trap should be placed directly on the ground and another trap several feet above the ground. Were more crawling or flying insects caught? Were more insects caught under trees, in the open, in weed areas, etc.? If possible, place the sheets outdoors on sunny days and then again on moist overcast days. Also compare night captures to daytime captures.

Insect Diversity #184

The diversity of insects can illustrate the principle of low diversity in harsh or new environments. Have your students pick two different areas on campus. One of these areas may be in a recovery stage from construction or grass cutting. Take at least 10 samples of 250 strokes each in both areas with insect nets. Place the specimens in killing jars and then sort them. The sorting should be made to the species level, but identification is not important. Simply separate by characteristics. Keep a record of the number of species and the total number of individuals. Place the date into the following formula:

$$\text{Insect Diversity} = \frac{\text{Total number of species}}{\text{Total number of individuals}}$$

Which area had the biggest diversity and why? Try to give reasons for differences in the species diversity, remembering that a larger diversity of insects would probably indicate a larger plant diversity also.

*Environmental Education - Lee County Schools

Insect Behavior - Kinekinetic Versus Orthokinetic #185

Insects under stress are said to typically exhibit one or two forms of behavior: (1) Kinekinetic behavior (which is simply a greater amount of turning). Students should work in pairs with a sheet of paper with two columns for each of the terms, which can easily be simplified. Testing a variety of insects in the field and placing them under stress by gently touching them with pencil or fingers, students should record on their work sheet the form of behavior (one of both) that was demonstrated by the insect. A wide range of insects should be tested (ants, spiders, centipedes, beetles, crickets, etc.). Class should compare their results and attempt to show predictable patterns of behavior for various insects.

Insect Movements #186

Go out on campus and have your students collect several different types of insects. Place each type of insect in a different shoe box. Cover the tops of the boxes with clear plastic, glass, or saran wrap so that the insects can be seen. Have the class observe the way the animals move. How do they use their legs? Are the legs or body parts adapted to any specific forms of movement? How does the insect's movement help it survive?

Naming Ants #194

Make a study of ant colonies. How many kinds of ants can you find? Give them descriptive names like mini-reds, two-tones, or pyramid builders.

Anthill Activity #195

Go outside and observe the activity around an anthill. Are ants carrying food? What kind? Do they pay attention to each other? Sometimes when an ant colony is disturbed, the eggs. larvae, and pupae can be seen. Watch nurse ants pick up mouthfuls of tiny white eggs, slender glistening ant grubs, or ant pupae, and carry them to safety. Some ants pupate in a papery cocoon. Others have a naked pupa which looks like a white, inactive ant with all parts formed, including legs.

Ant Food Preference #196

Students should divide into teams, each team choosing a separate ant colony. Place a small portion of several different foods in the vicinity of each colony: (1) cheese (2) bread (3) 40-50 grains of sugar (4) chocolate (5) dead insect (6) meat, etc. Each team should make the following notes: A. Time it took for ants to locate the food - each type; B. Action of the ants once they located food; C. Which of the items was their favorite food. Teams compare notes in the classroom.

Ant Tracking #197

Each student receives a piece of chalk and scrapes the chalk on the side of a plastic spoon or other item to obtain a small quantity of chalk dust. Students scatter over a wide portion of ground - each child locating an ant and marking the ant by pouring chalk dust on it. On hands and knees, follow your marked ant making note of its path by placing tiny markers (bits of gravel, lima beans, stuck-in toothpicks, chalk marks on blacktop, etc.) behind it every 6 inches or so. Follow the ant for some distance. Now review the trail and sketch the trail design on a piece of paper. Repeat activity, marking another ant in the same place as the first. Is there any pattern to the ant's movement? Compare your first to your second ant. Consider the class results. Compare trail sketches. Place broken pieces of bread prior to class and trace ants to their burrow. Utilize different colored chalk. Disturb the ant as little as possible as you pursue him - try not to alter his natural behavior. This is naturally adaptable for other insect or spider studies, beetles, jumping spiders, roaches, crickets, etc.

Ant Colonies #198

Utilizing the marking skills described in activity #197, locate a few separate ant colonies as close together as possible and douse each colony heavily with a different color of chalk dust. Divide students into teams to compare the movements of each colony, their interrelationships, etc. Present students with worksheets to fill in answers. What movement patterns exist within your colony? What is the greatest distance a marked ant has traveled from the colony? Do the ants have specific rates of movement? Do the ants coming from one hole ever enter another hole?

Measuring with Shadows #207

Older children can measure many large objects with shadows, since the size of a shadow is directly proportional to the size of the object. Thus if a 12-inch ruler held perpendicular to the ground throws an 8-inch shadow, and a tree shadow is 18 feet 6 inches (222 inches) long, the tree will be 27-3/4 feet tall (8:12 :: 222:x). Calculate the height of trees or the flagpole on campus.

Sun and Shadows #282

The sun's position in the sky may be studied by observing shadows at intervals throughout the day. With chalk, outline the shadow of an object at 10 A.M. Return and outline the shadow of the same object at 2 P.M. This may raise questions that involve coming out every hour on the hour the next day. Shadows not only change directions as the relative position of earth and sun changes, they also change size as the angle of light reaching earth changes.

Sundial #283

Make a sundial by marking a shadow of a fixed object, such as a flag pole or a stake driven into the ground, every hour. This can be done by driving numbered pegs into the ground or by marking the end of the shadow with stones with the hours marked on them. Check results the next day. It is exactly correct only on the day when it is made. Construct a gnomon (the pointer of a sundial) with an angle equal to the latitude of your school. Point it due North. Set it up and mark the hours.

Setting Your Watch By the Sun #284

Your watch can be set to the approximate time in the wilderness by the use of a compass. Find due South with your compass. Lay your watch on the ground beside the compass. Then, using a pencil or twig, cast a shadow over the watch to keep the hour hand of your watch pointed toward the sun. Turn the hands until South is midway between the shadow and twelve along the shorter arc. Your watch should then be set to within a few minutes of the local standard time.

Finding North and South Without A Compass #285

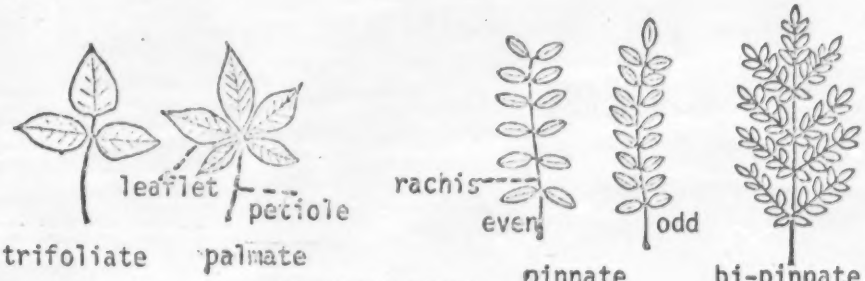
A compass direction can be taken by measuring the points of a shadow from the top of a stick in the ground. Placing a heavy stick or stake in the ground, place a marker (small stick or stone) where the tip of the shadow ends. Every twenty minutes or half hour, mark a new shadow point. The points will show to be a curve, once four or more readings have been made.

Next draw a large circle around the post. (A string and marker will assure an accurate circle.) Continue the curve that is indicated from the markers until your curve cuts across the circle. The two points where the curve intersects the circle will give you - East and West. Connect East and West points with a straight line. Draw a perpendicular line through this to give you North and South.

(Twice a year, while the sun is directly over the Equator, March 21 and September 21, or within a week of either side of these days, the shadow will represent itself in a straight line - East-West.) Make a survival story out of the exercise; see who finds their way back to camp.

145. GROUPING LEAF TYPES

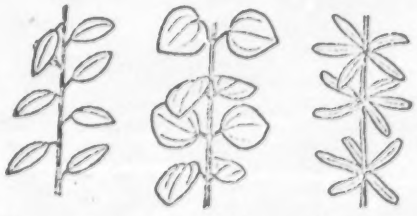
Reproduce the drawings below on handout sheets or have students copy them from drawings on the chalkboard. Ask students to locate on the school grounds trees, shrubs, weeds, or vines which demonstrate a simple leaf or the types of compound leaves in the drawing (or the type of classification being used). As a quiz technique, place specimens of the various leaf types around the room, each at a numbered station. Students proceed from specimen to specimen with their handout sheets and place each in the proper category. This and the related activities to follow prove to be excellent preparatory exercises to making a key to the trees (see activity #294). Preparing a scrapbook type of assignment - collecting from their neighborhoods one example of each arrangement, or as many as possible, makes an excellent homework project assignment.



COMPOUND LEAVES

146. GROUPING LEAVES BY THEIR ARRANGEMENT

Following the examples demonstrated in activity # 145, group trees, shrubs, weeds and vines by the arrangement of their leaves on the stem. Use leafless twigs also in your examples. This will necessitate students' looking for the placement of "leaf scars" - the site where the petiole was attached to the stem.



143. SOIL FUNGI

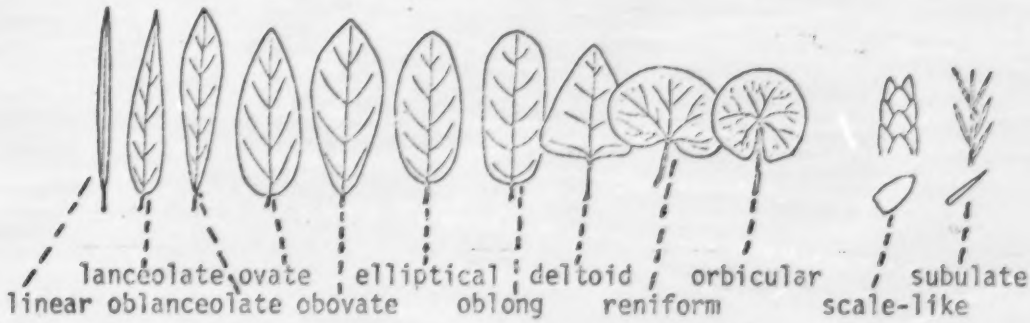
Collect soil samples from different areas of campus. Weigh one gram of soil from each site. Prepare 45ml of sterile nutrient agar with a pH of 5. Divide the agar equally among five test tubes. Cool the agar to approximatley 45°C (cool enough to hold in your hand). Place 1 gram of soil sample in the first test tube. Mix thoroughly. Transfer 1 ml from tube #1 to test tube #2, and then transfer 1 ml from tube #2 to tube #3. Continue this dilution technique until all tubes contain a soil and nutrient agar mixture. Now pour the contents of tube #1 into a sterile petri dish. Repeat this procedure for other tubes. Incubate the petri dishes for 7 days in a warm dark place. The petri dishes now contain the following amounts of soil: Dish #1 has .1 g, dish #2 has .01 g, dish #3 has .001 g, dish #4 has.0001 g, and dish #5 has .00001 g. Count the number of different fungi and make drawings of each. Record color differences. Record the number of fungi for each dilution and calculate the total number per gram of soil. How do the different areas compare? Does the amount of organic matter affect the number of fungi?

144. THE CAMPUS FOREST

Few school grounds have real forests, but most have hedges. A hedge acts in much the same way as a forest. What types of plants grow along the edge of the hedge? Are they the same as those directly under the hedge? Is the soil more moist under the leaves or in areas without leaf litter? Dig into the upper two to three inches of soil; can you see any evidence of decayed leaves in this soil? What are these leaves adding to the soil? Where can the most light be found: outside the hedge, at its edge, or under the hedge? How do these light differences affect what types of plants grow in the area? How do you think a real forest differs from the "hedge forest?"

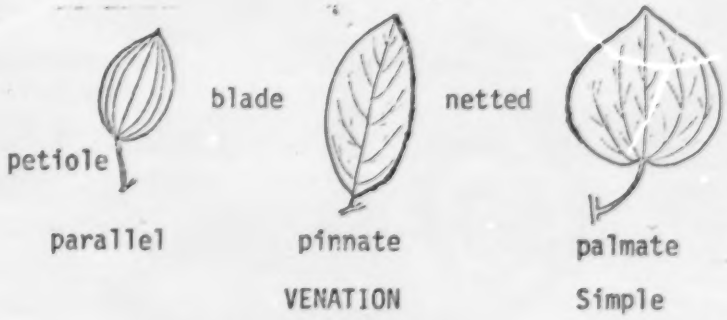
147. GROUPING LEAVES BY THEIR SHAPE

Following the patterns of activity #145, students should classify the leaves of their school grounds according to the shape of the leaf. In the manner of #152, simplify the terminology for younger children.



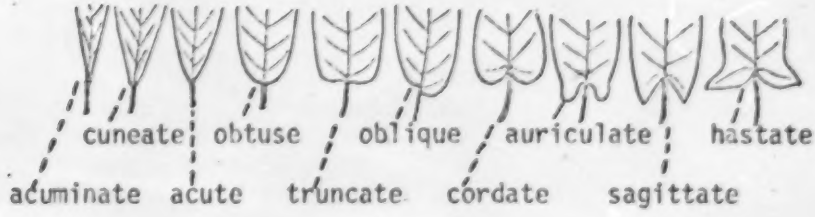
148. GROUPING LEAVES BY THEIR VEINS

Utilizing the three drawings below as described in activity #145, group the leaves of weeds, trees, shrubs, and vines by their venation. Associate the word "palmate," with the palm of your hand and its fingers radiating in different directions. Melaleuca trees are good examples of "parallel" venation.



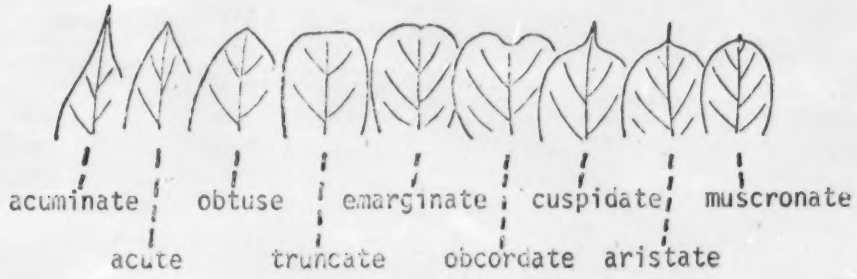
149. GROUPING LEAVES BY THE SHAPE OF THEIR BASES

The examples below demonstrate the different types of bases found on leaves. Utilize these in the manner described in activity #145.



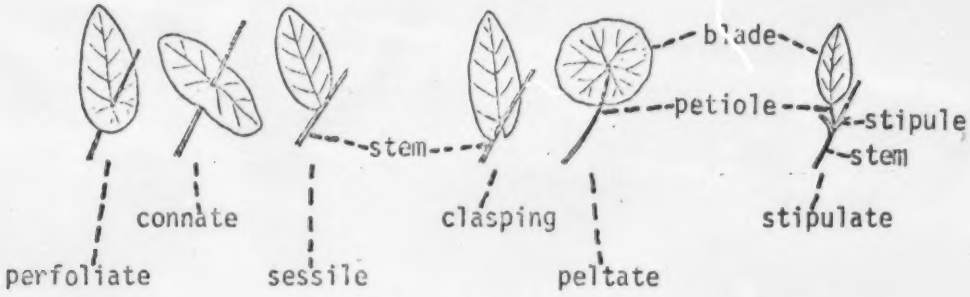
150. CLASSIFYING LEAVES ACCORDING TO THEIR TIPS

Utilizing the drawings below in the activities described in #145, allow students to classify plant leaves according to the shape of their tips. Simplify terminology for younger children.



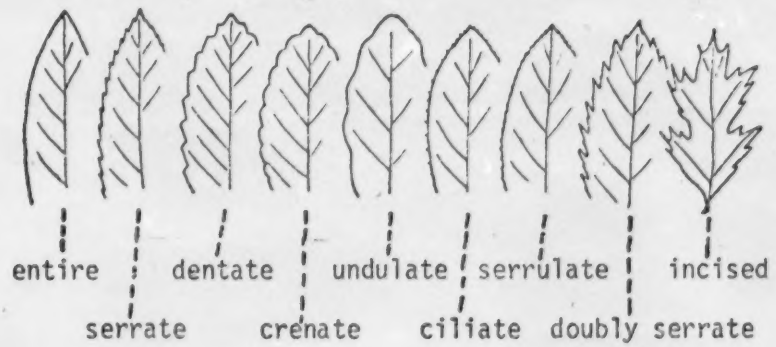
151. CLASSIFICATION OF LEAVES BY ATTACHMENT OF THE LEAF TO THE PETIOLE

This is a miscellaneous grouping system which may be useful when used with the similar preceding activities. The most common arrangement is not shown but is similar to the "sessile," only containing a petiole to form the actual attachment. This could be termed, "simple."



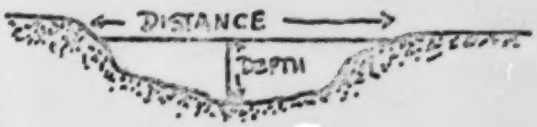
152. CLASSIFYING LEAVES BY THEIR MARGINS

In a similar activity described in #145, students should be able to place any leaf they discover in a category based on the margins of the leaf. For younger children, a simplification of the terminology would be desirable, e.g. entire (smooth), serrate (saw-toothed), dentate (toothed), crenate (lobed), undulate (wavy), ciliate (hairy), serrulate (finely saw toothed), doubly serrate (double saw toothed), incised (irregular saw toothed).



263. HOW MUCH WATER IS MOVING IN THE CANAL?

Have your class calculate the rate of flow in a canal or stream. Stream flow is the amount of water passing a fixed point during a specific amount of time. The formula for calculating flow is Q = AV (Q = discharge in cubic feet per second; A = cross section area of channel at sampling site; V = velocity at sampling site.) To obtain "A," determine the depth at the middle of the canal and the distance across the canal.



Next, connect the ends of the distance line with the bottom of the depth line to form a triangle. Use the formula, Area = ½ bh to obtain the area of this triangle.

To obtain "V" or velocity, place an object in the center of the canal and time its movement for 10 seconds. Repeat the timing procedure and obtain an average (be certain that the wind is not moving the object). Place the data for "A" and "V" in the formula and calculate "Q." By using the value for "Q" and information gained on the amount of such chemicals as nitrates and phosphates, the amounts of these materials passing from the canal into lakes, streams, and bays can then be discovered.

264. EROSION CONTROL

Have your students make a survey of the school campus for signs of erosion. A school campus map should be used and the areas showing signs of erosion should be marked in. Indicate the type of soil in the area and also vegetation types. The erosion should be classified according to what caused it; wind, water, cars, people, etc. Remedies should be formulated and a plan of action devised. The students should be allowed to make the campus improvements. For younger children, find an area on campus that has an incline. Pour water on the soil to show the effects of water erosion. Locate an area that has grass, and repeat the exercise. Ask the students how they would remedy the situation.

265. CANAL BANK EROSION

Select a canal bank near the school grounds and determine the change in slope and rate of the change. Divide the class into small groups and give each group a stick that is 50 inches long, a level, and then measure the vertical distance from the free end of the stick to the slope. Place the data into the following formula to determine the percent of slope:

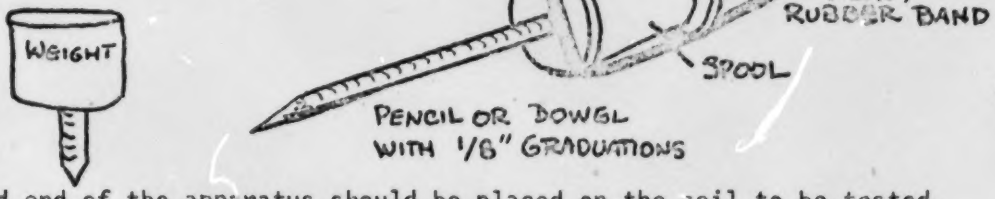
Vertical Distance X 2 = % slope

By repeating this activity at weekly intervals throughout the year, changes can be determined. Graph the results. Measure different areas of the canal bank and compare changes (bare areas compared to grass areas).

266. SOIL COMPACTNESS

Have groups of students build simple soil compactness testers and then determine the degree of soil compactness throughout the campus. A pencil or sharpened dowel, a large spool, and a heavy rubber band will be needed to construct the soil tester. Mark the pencil every eighth of an inch so that it can be used to measure force.

SOIL COMPACTNESS APPARATUS



The pointed end of the apparatus should be placed on the soil to be tested. By pushing down on the spool, the pointed stick will penetrate the soil. The student should record the number of marks the spool moves. A map can be made showing the areas tested. Notes should be kept about each test site. Such things as type of vegetation, exposure to sun or shade, rocky, sandy, or mixed soil should be recorded. Try to discover why some soils are more compact than others. Do people walk on the soils tested? Is the soil around an anthill as compact as that in the anthill? What roles do ants, worms, and other insects play concerning soil compactness?

267. SOIL PARTICLE SIZE

Divide your class into small groups. Give each group a quart jar approximately three-fourths full of water. Assign each group a different area of the campus to sample for soil particle size. Students should collect 4 tablespoons of soil from their sampling site. Place the soil in the jar of water and shake vigorously and then allow the particles to settle. It may take overnight to get complete settling (¼ teaspoon of alum and a teaspoon of household ammonia will speed up the process). Measure each layer and calculate the percent each layer is of the whole. Compare soils from different areas of the campus. Why do some areas differ?

268. SOIL AND WATER MOVEMENT

Divide your class into small groups. Give each group a quart can with both ends removed and a gallon of water in a bucket or milk jug. The object of this activity is to determine how different soils affect the movement of water. Each group should pick a different area of the campus to do their sampling. The can should be pressed about 1 inch into the soil at the sample site. Next, pour one gallon of water into the can and record the amount of time it takes the water to completely seep into the soil. If watches are not available, one student can roughly count off the seconds. Give each group a question page on which to keep their data:

What was your longest time? _____ Shortest? _____

What is the difference between soils? _____

Which soil is better? _____ Why? _____

How does man affect this rate? _____

What type of vegetation did you find at: longest time area? _____

shortest time area? _____

Why were these plants there? _____

Other questions can be added to this list as the situation warrants.

269. SOIL LEACHING AND PERCOLATION

Have your students determine the percolation rate of different soils on the campus. Divide the class into small groups and give each group a large tin can with both ends removed. Attach two or three layers of cheese cloth to one end of each can with rubber bands. Send the students outdoors and have them collect soil samples from different areas of the campus. Fill each can with soil from the sampling areas. Pack the soil into the cans so that it is approximately as compacted as it was at the sampling site. The cans should be filled within two inches of the top of the can. Hold the cans over clear jars or dishes. Pour three hundred milliliters of water into each can.. Keep a record of the number of seconds it takes the 300 ml of water to be absorbed by the soil. Measure the amount of water that ends up in the dishes. Compare the clarity of the residue waters. Which soils allowed the water to pass the fastest? Why? Which residue water was clearest? Why? Examine each sampling site for types of vegetation. How do the leaching effects and percolation limit plant growth?

270. DISSOLVED SOLIDS IN SOILS

Collect soil samples from different parts of the campus. Some samples may be taken from holes dug in the earth. Record where each sample came from. Mix a specific amount of soil with demineralized or distilled water. Filter the soil and water mixture. Allow the filtrate to evaporate or boil it to remove the water. Which soil has the most residue? Can any reasons be given for these results? The procedure can be done quantitatively by accurate measurements of soil, water, and residue if your students wish. Chemistry classes can further analyze the residue qualitatively.

271. SOIL TESTING

Locate an area on campus where the lawn grass is not uniform in color or texture. Divide the class into teams of three or four students per team. Give each team a small paper cup and a tongue depressor. Delineate a study area on the lawn that is approximately ten to fifteen meters on a side. The groups should distribute themselves evenly throughout the study area. One member of the class should make a map of the study area and indicate each group's position. Allow the students to decide on the method of distribution. The map should also include a rough approximation as to where the grass is growing well and where the texture and color do not seem normal. Each group should use its tongue depressor and scoop up 3 to 4 teaspoonfuls of soil from their sampling site. If other tests are going to be made, label the tongue depressors and push them into the ground at each sampling spot. Mix distilled water with the soil in each paper cup until the soil is muddy. Give each group a piece of red and blue litmus paper. Place the litmus paper into the mixture and allow them to stand for about five minutes. If the red litmus turns blue, then the soil is basic or alkaline. If the blue litmus turns red or pink, the soil is acid or acidic. Now transfer the results of this soil test to the map. Is there a correlation between the test results and the differences noted in the lawn grass? Was the grass at your test site healthy or unhealthy looking? What could be done to improve the health of the lawn?

272. FERTILIZER STUDY

Place different types of fertilizer on similar areas of the campus. Compare rates of growth of the plants in these different areas. What elements do the fertilizers have in them? Which fertilizer increased plant growth the most? Was it chemically different? Did any fertilizer decrease plant growth? Be certain to clearly mark each area, and to have control areas without any fertilizer.

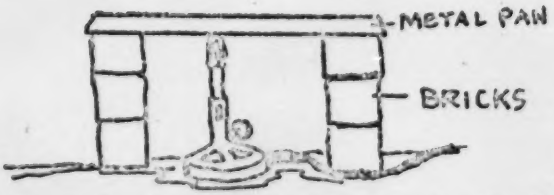
273. ESTIMATING ORGANIC MATTER IN THE SOIL

Have your students collect soil samples from different areas of the campus. The sampling sites should contain different types of plants and, if possible, different soil types. Each sample should be approximately 2 cc. Mark the sites on a campus map. Place each soil sample in a test tube. Add approximately 6 ml of 2% NaOH and shake for a few minutes. Allow the mixture to stand for 48 hours in a covered test tube. After the 48 hour period, observe the color of the solution above the soil. If the solution is dark black, the soil is medium in organics, and, if the solution is any other color, the soil has a low organic content. What does organic matter add to the soil that plants need? What types of plants were growing in the low, medium and high organic content soils? Which soils would hold water the longest? Why?

274. PERCENT OF ORGANIC MATTER IN SOIL

Send groups of students to different parts of campus and have them collect half a paper cupful of soil. Weigh each soil sample and record the campus area from which it comes. Also record the relative abundance of plants at the sample sites. Place the soil samples, one at a time, in a metal pan. Position the pan over a Bunsen burner flame and, using a glass rod, stir the soil sample.. This will burn the organic matter out of the soil. (If a kiln is available, place the weighed soil samples in the kiln for 24 hours at 600^{o}.) Let the sample cool and then subtract the burned weight from the unburned weight. This will give you the weight of the organic matter. To obtain the percent of organic matter:

$$\% \text{ Organic Matter} = \frac{\text{Weight difference between burned and unburned}}{\text{Unburned Weight}} \times 100$$



Spread soil out evenly and stir with glass rod.

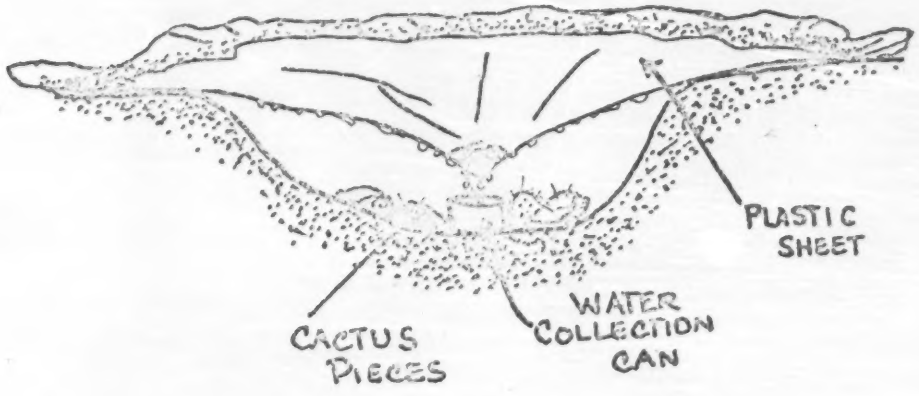
How do the different areas compare? Why do some areas have more organic matter than others? What effect do plants have on the amount of organic matter?

275. MAKE YOUR OWN SOIL

Take your students out on campus and collect a handful of pebbles or other rock fragments. Put the rocks in a cloth bag and pound them to a powder with a hammer. Then compare your "soil" to soil from an area where plants are growing. Examine the soils closely. What is missing from your homemade soil? The bits of decayed leaves and other plant parts add chemicals to the soil that plants need for growth. The decayed plant parts also help hold water in the soil. Mix some of the decayed leaves and twigs with your soil. Put this mixture in a pot and transplant a small plant to the pot. Water and place in a sunny spot.

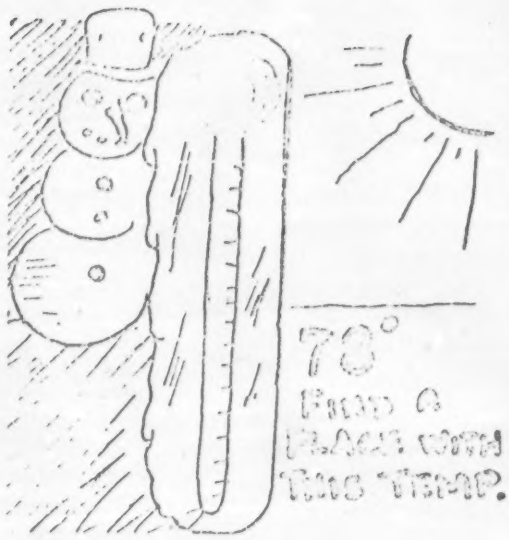
291. A SOLAR STILL FOR COLLECTING WATER

A survival method for collecting water can be demonstrated by using a piece of light plastic sheeting about 4 ft. square. Dig a hole about 3 feet across and about 1½-2 feet deep in a sunny place (preferably in moist ground). A wet sand area on the beach also works well. If cactus or moisture collecting plants are available, cut them in chunks and place them in the hole. In the bottom of the hole place a collecting receptacle (jar or can). Lay the plastic sheet over the hole and weight edges with stones to seal edges as tightly as possible. Place a stone in the middle on top of the plastic sheet above the approximate center of the receptacle. Moisture from the soil or plants will be drawn up by the heat of the sun. The cooler air above the plastic will result in condensation - the moisture of which will collect and run down the plastic to the lowest point where it drips off into the container. Choose a sunny day for your experiment. 1-5 pints of water may be collected in a day using this technique.



251. TEMPERATURE TAG

Divide the class into small groups. Give each group a thermometer and piece of paper with a temperature printed on the top. The students should go outside and find an area that has the same temperature as that on their paper. They should then write a short description of the area. Why were the temperatures different in different areas? Use the written descriptions to help explain differences.



252. RECORDING TEMPERATURES

Let children stand in the bright sunlight so their shadows are behind them and hold a thermometer in the light until the fluid stops moving. Note the temperature. Then have them turn in the opposite direction and hold the thermometer in the same position in their shadow. Wait for a change in temperature reading. Objects that block the sun shut off heat waves as well as light waves.

253. WIND ON THE CAMPUS

Determine the wind directions and wind effects on campus. Send students to areas throughout the campus. Try to include all parts of the campus such as near corners of buildings, breezeways, near trees and shrubs, parking lots, etc. Use pieces of light yarn or ribbon to determine wind directions. Draw a map of the school grounds on the chalkboard and indicate wind directions with arrows. Ask students to look for indicators that show which way the wind blows (piles of sand; litter in one area; trees bent in one direction, etc.). Could the school campus be designed to take advantage of wind directions; if so, how?

254. OVERCAST OBSERVATIONS

Take your students outside on an overcast day to make observations of the environment. If available, give small groups thermometers to determine the temperatures throughout the campus. Record the temperature readings on a campus map. Students should locate specific objects on the campus such as trees, buildings, open grass areas, and roadways. Look for such things as shadows and the relative amount of light penetrating beneath trees and shrubs. What do the clouds indicate? Now take your class out on a bright sunny day and repeat the same observations. Discuss the differences and similarities between the two sets of observations.

255. LIGHTNING ESTIMATES

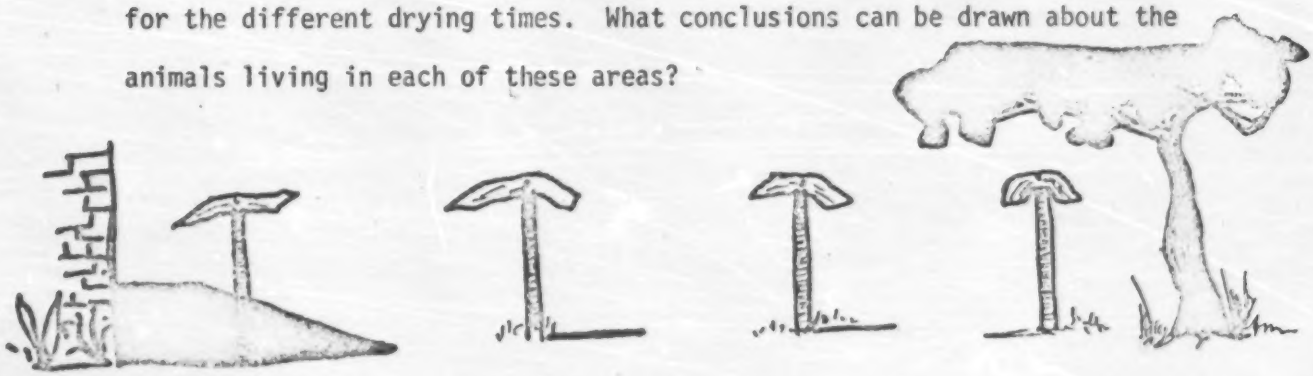
To estimate the distance lightning is away from your school, have your students use the following data: The lightning flash and the sound of thunder are produced at the same time. Light travels at 86,000 miles per second; thus, the flash reaches our eyes almost instantly. The sound of the thunder travels at a speed of approximately 1110 feet per second. By counting the number of seconds between the flash and the sound of the thunder, the distance in feet can be estimated.

256. EVAPORATION RATES

Have students place shallow pans of water at different locations on campus. Measure the amount of water in each pan with a graduated cylinder at the start and finish of the experiment. Record the result for each location. Allow the pans to sit for approximately one to four hours. Place the water pans under shrubs and trees, in an open grassy area, among some weeds, in the parking lot, etc. Why did water evaporate faster in some areas than in others? Was the wind the same at each spot? Was the amount of sunlight the same?

257. MEASURING EVAPORATION IN MINI-CLIMATES

The purpose of this study is to compare the different rates of evaporation (a product of air moisture) in different mini-climates. This, in turn, will help demonstrate the differences that exist in micro-communities. Wet several paper towels and squeeze them so that they are just damp. Open up the paper towels and place each in a separate mini-climate around the school grounds. (E.g. spread out; tacked on yardsticks above the ground in a sunny site; on yardsticks in the shade; on the top of shrubbery; on the ground; under a board.) Record the time you placed each towel in its place and the time when the towels were completely dry. Ask the students to give reasons to account for the different drying times. What conclusions can be drawn about the animals living in each of these areas?



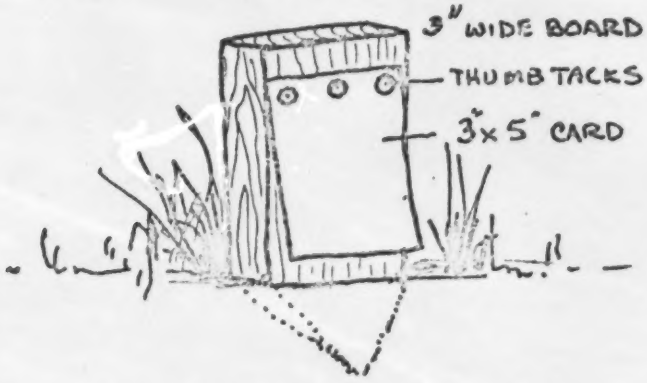
258. RELATIVE HUMIDITY

Have your students construct hygrometers and determine the relative humidity. A hygrometer shows us how much water or moisture is presently in the air as compared to the amount that the air could hold, if saturated. Relative humidity is represented as a percentage. Warm air can hold more moisture than cool air; thus, on a hot, muggy day, you can expect rain if it gets cool at night. To construct a hygrometer, wrap a piece of cloth around the bulb of a thermometer and place the loose end of the cloth in a dish of water. The thermometer is then suspended about an inch above the water, but not so far that the loose end of the cloth comes out of the water. This thermometer is called the wet bulb. Another thermometer is placed by the wet bulb, and is called the dry bulb since it does not have the wet cloth attached to it. Record the wet and dry bulb readings. Subtract the wet bulb reading from the dry bulb reading and locate this number in the chart. Next locate the dry bulb reading in the horizontal row where the number for the difference between wet and dry bulb readings was found. Follow the dry bulb reading column downward to find the percent of relative humidity.

No. of degrees difference between Wet and Dry Bulb Readings	Dry Bulb Readings in Degrees Fahrenheit							
1	90	92	93	94	95	96	96	97
2	79	84	87	89	90	92	92	93
3	68	76	80	84	86	87	88	90
4	58	68	74	78	81	83	85	86
6	38	52	61	68	72	75	78	80
8	18	37	49	58	64	68	71	74
10		22	37	48	55	61	65	68
12		8	26	39	48	54	59	62
14			16	30	40	47	53	57
16			5	21	33	41	47	51
18				13	26	35	41	47
20				5	19	29	36	42
22					12	23	32	37
24					6	18	26	33
Relative Humidity in Percent	30%	40%	50%	60%	70%	80%	90%	100%

259. SPLASH BOARDS

Have your students construct splash boards (see drawing) and place them in different types of soils on the campus.



The splash board can show how compact the soil is and, in many cases, can be used as an indicator of erosion potential. When it rains water will splash onto the board. The file card keeps the splashes from washing off. If the splashes contain soil, the soil will apppear on the board. This indicates that the soil is loose and may erode easily. After a rain, the boards from different areas can be compared. The higher water appears on the board, the more compact the soil is. How do grassy areas compare to areas without grass; to paths where people walk?

260. STORM RUNOFF

Have your students determine the amount of storm runoff from paved and surface areas on your campus. Determine the amount of ground area that is covered by buildings, parking lots, sidewalks, streets, athletic tracks, etc. Have a group of students call the local weather bureau and find out how much rain fell during the preceding year. Ask the weather man what area one inch of rain covers. From this information your students should be able to determine the amount of water runoff. The weather man should have conversion figures for inches of rain to gallons of water. Where did all this water go? What happened to the water before the surfacing and paving?

261. WATER DRAINAGE

Have students trace rainfall from the school campus to the Gulf of Mexico. Students should compose a map showing detailed drainage routes and outfall stations to the Caloosahatchee River or elsewhere. Attempt to identify possible pollution sources along the drainage routes.

262. WHAT HAPPENS TO THE RAIN?

During the rainy season have your students determine how much water falls on different areas of the campus and where that water drains. Make graduated cylinders from orange juice cans. Allow your class to establish where their rain gauges (juice cans) should be placed. Be certain that such areas as open lawns, under trees and shrubs, near buildings, and parking lots are included. Have your students locate drainage ditches, sites that show signs of erosion, areas where the soil is compacted, and areas where water stands. Are there areas that receive more water than other areas? Is the vegetation different in these areas? What effect does standing water have on soil organisms? On insect populations such as mosquitoes? Is improper drainage harming soil, buildings, or sidewalks? Where does water falling on the buildings, parking lots, streets, tennis courts, etc. go?

INTERDISCIPLINARY

Grades K-6

Trust Your Neighbor

Have one child in the group blindfolded and the rest of the children try to lead him safely to the outdoor classroom. Have the blindfolded person discuss how he felt en route. Take turns being the blindfolded person.

Quiet In The Woods

Have the class stay perfectly quiet in the outdoors for at least one minute. Discuss the sounds heard.

Continuity and Change

Change means that nothing stays the same. Continuity is a connection in time, space, and development.

As things change, they will be connected in time, space and development with what they were and with what they will be.

Look for changes and activities in nature, in how nature is constantly on the move. What changes will there be in a day, month, a year? - in a special place? - in your school?

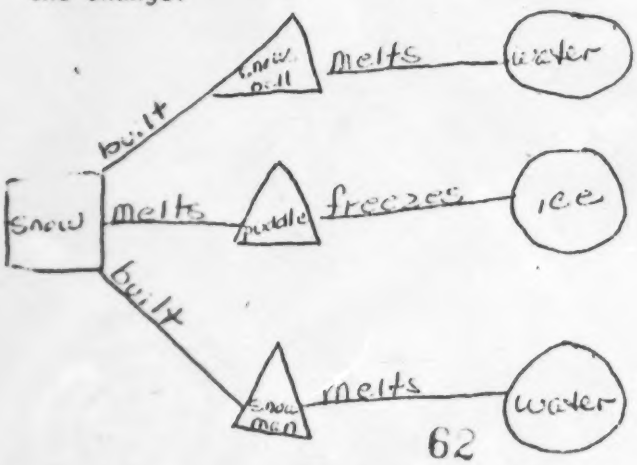
Draw a picture of how you think you will look twenty years from now.

Continuity and Change Game

Egg, tree, rock, grass, snow. Each of these things changes. Each can change into many different things. In turn, each new thing may change, etc.

Choose an object from the list above. Write it in a rectangle. Think of all the change that could happen to the thing. Then write in triangles what would exist.

Take each of these and write in circles all the things that would exist if there were another change. Write on the bars the name of the change.



Interaction And Interdependence

Interaction means at least two things acting upon one another.

Interdependence means at least two things depending on one another.

Concentrate on each of your senses while you are outside. Write as many answers to these questions as you can:

1. What can you see and hear?
2. What can you see and touch but not hear?
3. What can you see and hear but not touch?
4. What can you see but not touch or hear?
5. What can you smell but not see?

Make up more questions if you want to.

INTERDISCIPLINARY

Grades 4-5-6

Keep A Record

Keep a weekly record during the school year of the changes in a tree or in a small area of the outdoor classroom.

Patterns

Things that look one way on the outside usually reveal completely different designs or patterns on the inside.

If a tree is cut across, you see a pattern of circles. If a tree is cut the long way, there is a pattern of long lines.

Draw cross-section views of the following things: tree, orange, flower, cabbage, twig, anthill, etc.

Keeping A Log

Use a notebook or binder to write down about the outdoor classroom. Include your feelings, questions, facts drawings, maps. The notebook is not to be graded; it is a personal journal.

Exploring On Hands And Knees

Pick a small area about 4 feet across to explore closely. Make sure you have a pad and pencil to record your findings.

Move slowly on hands and knees; explore carefully, listening and looking at rocks or plants or insects. Examine and touch the things carefully. Use a magnifying glass. Move things aside carefully and return things to where you found them. Make drawings of what you see. Come back on a different day to the same spot and observe.

How many insects can you find?
What sizes are they? What color?
Can you find any insect homes?
Can you hear any insect noises?
What are they doing? Are they eating?
What do you see? What do you feel?
What kinds of things can you find?
Notice soil colors, textures, and particle size.
What kinds of stones and pebbles are there?
What kinds of plants? How do they smell?
How do they compare in height? In color?
What are the shapes of leaves?